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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/823,105

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EXAMINER

HON, SOW FUN

ART UNIT

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/823,105	<b>Applicant(s)</b> KOBAYASHI ET AL.	
	<b>Examiner</b> SOPHIE HON	<b>Art Unit</b> 1794	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 August 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 8-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Response to Amendment***

***Withdrawn Rejections***

1. The 35 U.S.C. 103(a) rejection of claims 8-13 over Yoshikawa in view of Kobayashi, Asano and Fujimura is withdrawn due to Applicant's amendment dated 08/19/08.

***New Rejections***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 103***

2. Claims 8-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa (Frequency Modulation Response of a Tunable Birefringent Mode Nematic Liquid Crystal Electrooptic Device Fabricated by Doping Nanoparticles of Pd Covered with Liquid-Crystal Molecules, Japan Journal of Applied Physics, vol. 41) in view of Kobayashi (US 4,701,024), Asano (US 4,909,605) and Fujimura (US 4,836,654).

Regarding claims 8-9, Yoshikawa teaches liquid crystal-soluble particles dissolved or dispersed in a matrix liquid crystal in the liquid crystal layer of a liquid crystal device element (liquid-crystal EO device, using a liquid crystal as a host medium called NLC1, where the device is doped with PD nano-particles that are covered with other NLC molecules, L1315a, 2<sup>nd</sup> paragraph), wherein each of the liquid crystal-soluble

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particles comprises a core having a diameter of 2.5 nm (page L1315a, 3<sup>rd</sup> paragraph), which is within the range of smaller than 100 nm, which comprises a plurality of nanoparticles; and a protective layer comprising liquid crystal molecules is provided on the periphery of the core (core metal nanoparticles, page L1315a, 3<sup>rd</sup> paragraph), which renders the particle liquid-crystal soluble. Yoshikawa teaches that the liquid crystal device element is a liquid crystal display device element (page L1315a, 2<sup>nd</sup> paragraph), but fails to disclose that it comprises the basic components of: a liquid crystal layer formed between a pair of parallel substrates and conductive layers provided respectively on facing inner surfaces of these substrates; and the common components of a pair of liquid crystal alignment layers provided respectively with pre-tilt angle on facing inner surfaces of the conductive layers; wherein the liquid crystal layer is formed between the pair of liquid crystal alignment layers.

However, Kobayashi teaches that a liquid crystal display device element shown in Fig. 2A (cell, column 4, lines 30-34) comprises the basic components of: a pair of parallel substrates (transparent plates 5, 6, column 4, lines 34-35); conductive layers provided respectively on facing inner surfaces of these substrates (electrodes 7 and 8 on the inner surfaces, column 4, lines 34-37); and a liquid crystal layer formed in between (liquid crystal molecules 3, column 4, lines 36-38), wherein metal particles (column 4, lines 66-68) are dispersed in the liquid crystal (column 6, lines 37-40), for the purpose of providing the liquid crystal with an effective switching function (column 5, lines 35-42). Kobayashi fails to teach that the liquid crystal layer is formed in between a pair of liquid crystal alignment layers formed on the facing inner surfaces of the pair of

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conductive layers, wherein the alignment layers are provided respectively with a pre-tilt angle.

However, Asano teaches that the liquid crystal layer in a liquid crystal display device element is commonly aligned between a pair of liquid crystal alignment layers provided respectively on facing inner surfaces of a pair of parallel substrates (pair of substrates each having an alignment layer, column 2, lines 43-47) wherein the liquid crystal alignment layers are provided respectively with a pre-tilt angle (column 3, lines 1-2), for the purpose of providing the desired pre-tilt angle to the liquid crystal (column 5, lines 43-50).

Therefore, since Yoshikawa is silent regarding the components of the liquid crystal display device element, it would have been necessary and hence obvious to have looked to the prior art for suitable ones. As such, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have formed the liquid crystal device element of Yoshikawa, by disposing the liquid crystal layer containing the liquid crystal-soluble metal core particles, in between a pair of liquid crystal alignment layers formed on the facing inner surfaces of a pair of conductive layers which are provided on the inner surfaces of a pair of parallel substrates, as taught by Kobayashi, and as modified by Asano, wherein the liquid crystal alignment layers are provided respectively with a pre-tilt angle, in order to align the liquid crystal layer with the desired pre-tilt angle, as taught by Asano.

In addition, Yoshikawa teaches that voltage is applied across the electrodes of a pixel while modulating at least the frequency (drive this device by changing the

frequency of the applied voltage across the electrodes of a pixel, L1317b, 1<sup>st</sup> paragraph), which indicates the presence of a control circuit for applying voltage while modulating the frequency, provided on the conductive layer for varying light transmittance of the liquid crystal layer, as evidenced by Kobayashi.

Kobayashi teaches that a liquid crystal device element has a control circuit for applying voltage on a conductive layer for varying the light transmittance of the liquid crystal layer (circuit 27, transparent electrode 26, orientation state of the liquid crystal 23 will vary and a displaying function will be developed, column 7, lines 20-30, Fig. 12).

Additionally, Yoshikawa teaches that under a constant applied voltage, an electro-optical response of the liquid crystal display element is turned on and off by switching the frequency of the applied electric field (drive this device by changing the frequency of the applied voltage across the electrodes without changing the amplitude, page L1317b, 1<sup>st</sup> paragraph), but fails to specify that the electro-optical response is turned on by switching the frequency of the applied electric field from low frequency to high frequency, and turned off by switching the frequency from high frequency to low frequency, or that a time constant of response concerning turning the electro-optical response on and off is in a range of 0.1 ms to 10 ms.

However, Fujimura teaches that the electro-optical response of the liquid crystal layer of a liquid crystal device element can be turned on by switching the frequency of the applied field from low frequency to high frequency, and turned off by switching the frequency of the applied field from high frequency to low frequency (electrically controlled birefringent type liquid crystal device is turned on/off upon selective

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application of electric fields of two frequencies, i.e. high and low frequencies (column 4, lines 57-64), wherein a time constant of response concerning turning the electro-optical response on and off is in a range of 0.25 ms to 0.3 ms (column 23, lines 40-45), which is within the claimed range of 0.1 ms to 10 ms, for the purpose of providing the desired display response (column 1, lines 5-20).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have turned on the electro-optical response of the liquid crystal device element of Yoshikawa by switching the frequency of the applied electric field from low frequency to high frequency, and to have turned it off by switching the frequency from high frequency to low frequency, where a time constant of response in turning the electro-optical response on and off is within in a range of 0.1 ms to 10 ms, in order to provide the desired display response, as taught by Fujimura.

Regarding claim 10, Yoshikawa teaches that the frequency modulation range of the electro-optical response is in a range of 20 Hz to 120 Hz (L1317b, 1<sup>st</sup> paragraph), that is within the claimed range of 20 Hz to 100 kHz.

Regarding claim 11, Yoshikawa teaches that the nanoparticle constituting the liquid crystal-soluble particle is at least one kind of metal atom selected from Pd (page L1315a, 2<sup>nd</sup> paragraph).

Regarding claim 12, Yoshikawa teaches that the liquid crystal device element is driven by using an active matrix mode (matrix driving, L1317b, 1<sup>st</sup> paragraph).

Regarding claim 13, Yoshikawa discloses in Fig. 1©, shown on the next page, that the short axis width of the liquid crystal molecule is equal to or less than the diameter of the core.

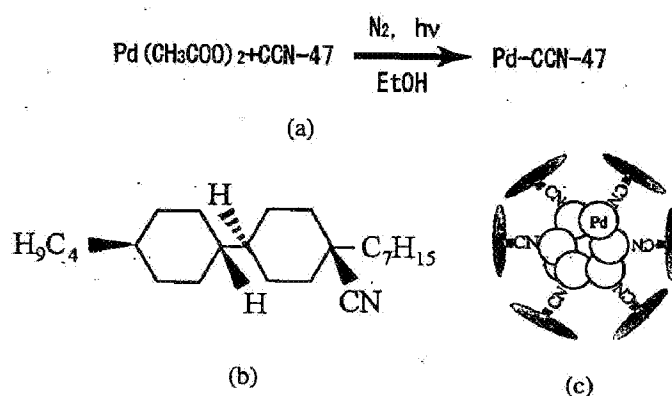


Fig. 1. Synthesising process of Pd-CCN-47 using an alcohol reduction method, where (a) is a chemical equation showing the synthesising process of Pd-CCN-47, (b) shows the CCN-47 chemical structure, and (c) illustrates the Pd-CCN-47 nanoparticles.

### ***Response to Arguments***

3. Applicant's arguments regarding the continued use of the combination of Yoshikawa in view of Kobayashi, Asano and Fujimura have been fully considered but they are not persuasive.

4. Applicant argues that while the present invention and Fujimura are common in the aspect that their electro-optical responses are turned on/off by changing the frequencies, their respective mechanisms in terms of frequency dependency as seen in electro-optical response are totally different since unlike Fujimura, the present invention



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does not utilize the inversion phenomenon between the positive and negative dielectric anisotropies caused by the change in frequencies.

Applicant is respectfully apprised that Yoshikawa is the primary reference that teaches all the components in the liquid crystal layer of Applicant as described above, as well as the mechanism of frequency dependency as seen in the electro-optical response of Applicant's liquid crystal layer, where under a constant applied voltage, the electro-optical response is turned on and off by switching the frequency of the applied electric field (drive this device by changing the frequency of the applied voltage across the electrodes without changing the amplitude, page L1317b, 1<sup>st</sup> paragraph).

Yoshikawa only fails to specify whether the electro-optical response is turned on or off by switching the frequency from low frequency to high frequency, or vice-versa.

Fujimura is the secondary reference that teaches that the electro-optical response of a liquid crystal layer in a liquid crystal device element is turned on by switching the frequency of the applied field from low frequency to high frequency, and turned off by switching the frequency of the applied field from high frequency to low frequency, for the purpose of providing the desired display response speed, as discussed above.

***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number is (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith Hendricks, can be reached on (571)272-1401. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Sophie Hon/  
Examiner, Art Unit 1794

/KEITH D. HENDRICKS/  
Supervisory Patent Examiner, Art Unit 1794